DOCUMENT RESUME

ED 280 440 IR 012 576

AUTHOR Cicchelli, Jerry J.; Richards, Edgar L.
TITLE The Implementation and Preliminary Results of an Action Research Project in the Mahopac Schools.
PUB DATE [83]
NOTE 10p.; Best copy available.
PUB TYPE Reports - Research/Technical (143)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Behavioral Objectives; Computer Assisted Instruction; *Computer Literacy; Curriculum Development; *Learning Activities; *Microcomputers; Naturalistic Observation; Primary Education; *Student Behavior; *Teacher Behavior
IDENTIFIERS *LOGO Programing Language

ABSTRACT

This 3-month investigation of changes in teaching and learning behaviors as microcomputers and computer literacy are integrated into the curriculum involved nine primary teachers (Mahopac Central School District, New York) in grades 1 to 3, who had received training in the use of microcomputers and in Logo. Each teacher implemented the same computer literacy program, but the number of microcomputers per classroom varied from one to four for each grade level. Data were collected by administrators and the Director of Computer Education, who observed teachers and students and recorded 15 agreed-upon classroom behaviors in standard written format. Selected preliminary findings indicate the following: some students preferred directed learning experiences with the computer while others preferred to experiment on their own; students mastered the Logo programming objectives faster than expected; students preferred to be helped by other students rather than by teachers; students in grades 2 and 3 preferred to work with the computer independently rather than in pairs; computer work in grade 3 increased student on-task behavior; hyperactive students engaged themselves attentively with the computer; and the use of synthesized speech in reading CAI software appears to aid word recognition among slower students in the first grade. Although one computer in a classroom was found to be insufficient for class needs, none of the student behaviors observed was found to be related to a specific number of microcomputers in the classroom. Twelve references are provided. (DJR)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED280440

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☒ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

THE IMPLEMENTATION AND PRELIMINARY RESULTS OF AN ACTION RESEARCH PROJECT IN THE MAHOPAC SCHOOLS

Jerry J. Cicchelli

Edgar L. Richards

Mahopac Central School District

Mahopac, New York

10574

IR012576

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
Jerry J. Cicchelli
Edgar L. Richards
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

BEST COPY AVAILABLE

Computers are being introduced at a rapid rate into America's schools. The basic purposes for which they are being acquired are essentially two: (1) computer-assisted instruction (CAI) and (2) computer literacy. There is increasing pressure on schools to get "on the bandwagon" and equip themselves with appropriate hardware and software.

Computers are attractive purchases for schools. Once purchased, their use in schools has been focused on CAI (Joiner, et al., 1980). Research on CAI alone has not shown it to be any more effective than traditional instruction (Slesnick, 1983). Drill and practice exercises, the most common form of CAI experiences, may shorten learning time (zemke, 1983; "microcomputers", 1982) but they do not seem to add to student conceptual understanding. Thus, traditional CAI is best viewed as a supplement to traditional instruction (Slesnick, 1983).

Time magazine, in recognizing the "Machine of the Year" in its January 3, 1983 issue, screams "A New World Dawns" (p. 13). Over 75 colleges and universities already require that every student have a microcomputer. What school or school system wishes to be blamed for neglecting curriculum in computer literacy such that graduates are unprepared to face the brave new world where "by the millions, (the computer) is leaping its way into offices, schools and homes." (The Computer Moves In", 1983)

Conceptually, computer literacy can be considered to be that enabling set of skills and competencies which permits students to understand and use a computer for required purposes, including self instruction. In this view, CAI skills are subsumed under the umbrella of computer literacy. A total program of computer literacy would include instruction aimed at developing the following abilities: (1) the ability to control a computer to achieve various academic goals (programming); (2) the ability to use available programs for self instruction and problem solving; (3) the ability to use a computer for information retrieval and communication; and (4) the ability to grasp the impact of computer technology on modern society (Levin, 1983a).

Papert (1980) notes an interesting dichotomy of student relationships to the computer: (1) one when the computer controls the student (as in CAI) and (2) one where the student controls the computer (as in programming). In the computer-controlled relationship, student learning behavior is not unlike that usually expected of students in school: relatively passive and directed by the teacher. On the other hand, as the student assumes control of the computer by communicating with the machine in its own language, a set of active and self-directive learning behaviors can be expected to emerge which may be transferred in such a way as to change the way in which the learner learns. In the interactive situation, the student becomes an active and independent learner (Zemke, 1983).

These new learning behaviors, because they are atypical in the normal course of today's schooling, require careful study. As students begin to exhibit new learning behaviors, teachers must exhibit new teaching behaviors if the teacher-learner relationship is to foster more productive schooling.

One can seek to predict the kinds of behavioral changes that might be expected as children become more active in learning how to learn. Likewise, one can reason the kinds of teaching behaviors that might emerge in the new teaching-learning environment. It is, however, only through the systematic observation of students and teachers as they interact in the new environment that the new unexpected behaviors can be defined, and predictions confirmed.

The policy implications of the results of this type of research fall into three domains: materials acquisition, curriculum, and staff development.

The extent to which teaching and learning behaviors change when the computer is used as an instructional tool should influence the acquisition of computer hardware and software. Behavioral data can be interpreted to guide school district decisions on the number of computers in each classroom that fosters the appropriate teaching-learning environment. The expected balance of the various types of CAI and interactive computer learning in the classroom determines the kinds and amount of available software, as well as the distribution system for that software.

In the area of curriculum, data from investigations such as this one can guide the establishment of computer literacy objectives and the extent to which the computer becomes a part of such programs as writing (cf. Slesnik, 1983), reading, language arts, mathematics, and problem solving. "There is no academic or curricular tradition associated with computers." (Zemke, 1983, p. 43) Unable to rely on standard practice, districts must have data to make reasoned and informed decisions on curricular matters.

Just as there is no curricular tradition to guide program planning in the computer domain, there is likewise no wellspring of craft knowledge on which the teaching staff can rely to guide their instructional behavior with computers. Therefore, as data from studies such as this one elucidate the kinds of teaching behaviors which foster maximum student learning through the use of computers, staff development programs can be tailored to fit emerging needs (Levin, 1983b). While lists of teacher skills have been developed through the use of surveys (cf. "Teachers Need These Computer Skills", 1983), it is essential that local staff development programs focus clearly on those teaching behaviors that will promote the attainment of curricular goals established on a local level.

Thus, in this limited qualitative research study we ask the question: How do teaching and learning behaviors change as microcomputers become an element of classroom life and as computer literacy becomes a part of the school curriculum?

In this study of one school district, nine classrooms in three buildings will be examined. It is hoped that this limited study will allow for generalization from classrooms to buildings and from buildings to the district, thus guiding policy decisions on a local level. Perhaps if similar qualitiative research is done elsewhere, the validity of further generalization will be strengthened (Herriott and Firestone, 1983).

The possible financial investment of local districts in computer education is very High. The programmatic implications cut to the very essence of the educational process. It is therefore of extreme importance that decisions be guided by well-considered evidence.

Method

In the 1982-83 academic year, microcomputers were introduced into the primary school program in the Mahopac Central School District. By March, 1983, every classroom, grades 1-3, had, as part of its teaching equipment, at least one LOGO-capable Texas Instruments 99/4A microcomputer. Every primary teacher and elementay school administrator had received at least 10 hours of inservice training in the classroom use

of the microcomputer and in the LOGO programming language.

It was decided that, to study the changes in teaching-learning behaviors, three teachers from each grade level would participate in this study. All teachers would implement the same computer literacy program. One teacher on each grade level would implement the program with a single microcomputer present in the classroom; one teacher on each grade level would do so with two microcomputers in the classroom; and one teacher at each grade level would provide the program with four microcomputers in the classroom.

The objectives would be agreed upon in advance by the participating teachers. Teachers and students would be observed by administrators and the Director of Computer Education, who would record classroom behavior in standard written format.

During a three-month period, the participants would hold a series of discussions in an attempt to generalize, if possible, the behavioral results of the computer literacy intervention.

Project Description

After all primary teachers and school administrators were trained in the LOGO computer language, TI99/4A microcomputers were distributed one-to-a-classroom in all four elementary schools of the Mahopac Central School District. As a matter of administrative expediency, only three of the district's four elementary schools were selected for study in this project. From these three schools, three classrooms were selected at each grade level, first through third.

Nine teachers were needed for the project. Those selected were secure, tenured, and experienced primary-level teachers who had prior training in computer literacy and an interest in this type of research.

Two organizational meetings were held with the nine partcipating teachers. At these meetings, the rationale of the research proposal was discussed and program objectives were agreed upon. The selected objectives, which essentially parallel those contained in other schemata (cf. Bitter, 1982), are as follows:

Goal: The students will acquire the ability to control a computer to achieve various academic goals.

Objectives

The student correctly uses the following LOGO commands:

Grades 1, 2, and 3
- TELL TURTLE
- CLEARSCREEN
- FORWARD
- BACK
- RIGHT
- LEFT
- HIDETURTLE
- SHOWTURTLE
- PENERASE
- HOME
- COLORBACKGROUND

Grades 2 and 3
- PENDOWN
- PENUP
- TELL SPRITE
- CARRY
- SETCOLOR

Grade 3
- NOTURTLE
- SETHEADING
- SETSPEED

Goal: The student will demonstrate the ability to use available programs for self-instruction and problem-solving.

Objectives: (Grades 1, 2, and 3)

1. The student correctly loads "command module" software into the TI99/4A microcomputer.

2. The student uses the computer keyboard with a degree of proficiency needed to correctly use "command module" software.

3. The student correctly uses the special key commands defined for the software used.

4. The student correctly and independently uses one mathematics activity and one reading/language arts actvity on a "command module" learning package.

Goal: The student will be able to solve geometric problems using the LOGO computer language.

Objectives: The students will accomplish, the following, using LOGO commands:

Grades 1, 2, and 3
- Construct a square.
- Construct a letter of the alphabet (student choice).
- Construct a line from "home" to a given point on the video screen.

Grades 2 and 3
- Construct a rectangle.
- Determine the LOGO boundaries of the video screen.
- Put two visible sprites on the video screen.

Grade 3
- Construct any polygon (other than a rectangle).
- Draw a design on a piece of paper and duplicate the design on the video screen.
- Put one moving sprite on the video screen.

In discussions about expectations for student advancement in areas not reflected by the stated objectives, teachers predicted that youngsters exposed to the literacy objectives might also progress rapidly in the following areas:

- following directions
- directionality (left/right)
- color recognition
- spelling
- manual dexterity
- eye-hand coordination
- task-attention
- equality/inequality relationships
- geometric concepts
- sequencing
- proofreading
- self-correction
- independent problem-solving tactics

Preliminary Findings

As a result of initial data collection and discussion, some interesting preliminary findings have emerged, as follows:

Student Learning Behaviors

1. Some students prefer specific, directed learning experiences with the computer; others prefer to experiment on their own. This dichotomy of learning style prevails across grade levels (1 through 3), but not across ability levels. The directed/experiential learning preference appears not to be restricted to particular ability groups in the first grade. In grades 2 and 3, however, the high ability groups prefer, and in some instances show a need for, high levels of teacher direction; the lower, "middle of the road" achievers like to experiment independently and thus become more open to serendipidous learning.

2. It is a popular expectation that in the one-on-one, somewhat "private", interaction of student with the computer, that pupil reaction to failure will be neither condemning nor frustrating. Preliminary data do not confirm this expectation with the high achieving, intense student in grades 2 and 3. These high achieving, intense students seem to prefer directive experiences (CAI) with the computer over interactive (programming and problem solving) computer learning experiences. Also, these intense students are described as becoming "up tight" on experiencing a lack of immediate success in computer problem solving. This reaction to failure appears to engender a need for teacher reassurance, guidance, and additional direction.

3. In curricular planning, care was taken so as not to overwhelm the youngsters with too many objectives in the area of LOGO programming. On all three grade levels, students are mastering the objectives faster than anticipated. This acceleration in learning is noted at all ability levels as well as in students who have experienced learning and emotional problems.

4. In comparing student preferences for CAI or programming, most students in grades 1, 2, and 3 prefer LOGO programming (with the exception of the

intense high achievers noted above). Students appear to enjoy the sense of control over the machine that they experience in programming.

5. Student choice of CAI experience is of interest. Left to their own designs, pupils in grades 1 and 2 tend to choose what their teachers feel is easy CAI software. However, in choosing the easy software, two effects are notable: The students do not become bored, and they tend to select activities in areas which their teachers feel are areas of weakness. First graders appear to prefer CAI modules in reading to those in mathematics.

6. There is an interesting socializing process, which seems to be fostered in the computer literacy program: Students help other students. Regardless of grade level, students tend to turn to other students for help and appear to prefer the assistance of another student to that of a teacher. In one third grade classroom, the teacher initially trained a cadre of 3 student helpers: this group of helpers grew in number quite informally as other students assumed this role through selection by other pupils for assistance. While students freely seek help from other students, it is notable that the need for help does not diminish pupil interest in computer literacy.

7. Observation has become a very pronounced LOGO learning behavior among students at all three grade levels. Students enjoy watching others program in LOGO. Subsequent to observation, pupils will incorporate observed LOGO techniques into their own repertoire of programming skills.

8. Skill development in computer keyboarding seems to be facilitated by familiarity with the standard typewriter keyboard and by experience with computer games. In classrooms where a primary typewriter had been used as a part of the writing program, students appear to "keyboard" with less difficulty. Where computer maze games were employed as part of the introduction of the computer to the classroom, keyboard skills likewise seem to come easily to the students.

9. In general, pupils in grades 2 and 3 prefer to work with the computer independently, rather than in pairs or groups. As a consequence of individual programming, there appears to arise a preference for independent problem solving.

10. The student enthusiasm for working with the computer is universal. However, at least in grade 3, there appears to be an expected positive relationship between the confidence a student has in working with the computer and the amount of time the student wants to spend on computer literacy.

11. In first grade, the classroom computer does at times appear to be a definite source of distraction for the sudents who are not working with the computer. In third grade, however, students can and do disengage themselves from these distractions.

12. In third grade, work with the computer appears to increase student on-task behavior. This phenomenon is not limited to on-task behavior while at the computer, but seems to carry over to all classroom work.

13. Related to #12, above, is a noted effect in the first grade with

children who have been medically diagnosed as hyperactive. The hyperactive students will engage themselves attentively while working at the computer while failing to do so while involved with classroom seatwork.

14. In first grade, the use of synthesized speech in reading CAI software appears to aid word recognition among slower students.

15. One teacher in grade 2 has observed the phenomenon that in computer graphics, left-handed students tend to create geometric figures by moving the LOGO "turtle" to the left, while right-handed students do so by moving the "turtle" to the right.

Hardware Implications

1. In general, primary teachers find that a single classroom computer is insufficent to provide for the computer literacy needs of a class.
2. None of the fifteen student behavior observations, above, have yet been related to a specific number of microcomputers in a classroom.

References

A new world dawns. Time, January 3, 1983, p. 13.

Bitter, G. G. The road to computer literacy: Part II: Objectives and activities for grades K-3. Electronic Learning, 1982, 2 (2), 34-37, 85-86.

Herriott, R. E. and Firestone, W. A. Multisite qualitative policy research: Optimizing description and generalizability. Educational Researcher, 1983, 12 (2), 14-19.

Joiner, M. L., Miller, R. S., Silverstein, R. and Burton, I. Potential and limits of computers in schools. Educational Leadership, 1980, 37, 498-501.

Levin, D. Everybody wants 'computer literacy', so maybe we should know what it means. The American School Board Journal, 1983, 170 (3), 31-32.

Levin, D. Teach teachers computer skills. The Executive Educator, 1983, 5 (3), 19-20, 25.

Microcomputers. The School Administrator, April, 1982, p. 26.

Papert, S. Mindstorms: Children, computers and powerful ideas. New York: Basic Books, 1980.

Slesnick, T. Hold it: You're using computers the wrong way. The Executive Educator, 1983, 5 (4), 29-30, 32.

Teachers need these computer skills. The Executive Eduator, March, 1983, p. 20.

The computer moves in. Time, January 3, 1983, pp. 14-24.

Zemke, S. Microcomputers and education - Choices and consequences. Educational Computer Magazine, 1983, 3 (2), 42-43,45.